

Hall Thrusters and Erosion (Lifetime) Measurements

Completed Technology Project (2011 - 2015)



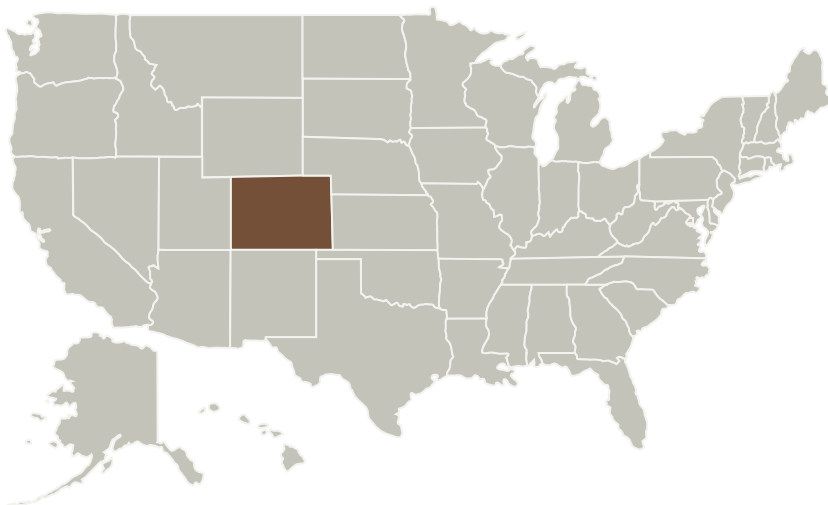
Project Introduction

The goal of Brian's research is to develop a new paradigm for measuring the sputter erosion rate of Hall thrusters in (near) real-time and in situ. To this end, Brian is developing laser sensors based on the ultra-sensitive cavity ring-down spectroscopy (CRDS) technique and is using these sensors to measure sputter products in the plume of the operating thruster. As part of this fellowship Brian will work with Hall thruster researchers at NASA Glenn Research Center with the overarching goal of transferring the diagnostics capability from his university laboratory to NASA. In comparison to the currently used full life testing approach, the use of the CRDS sensor will have several advantages: thruster erosion can be measured in situ with high sensitivity readily allowing one to study changes in erosion rate with time and with thruster operating conditions; the sensor can be used relatively quickly and inexpensively; the sensor data provides number density and velocity information on the sputtered particles enabling comparisons against numerical models (and model validation).

Anticipated Benefits

In comparison to the currently used full life testing approach, the use of the CRDS sensor will have several advantages: thruster erosion can be measured in situ with high sensitivity readily allowing one to study changes in erosion rate with time and with thruster operating conditions; the sensor can be used relatively quickly and inexpensively; the sensor data provides number density and velocity information on the sputtered particles enabling comparisons against numerical models (and model validation).

Primary U.S. Work Locations and Key Partners



Project Image Hall Thrusters and Erosion (Lifetime) Measurements

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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Primary U.S. Work Locations

Colorado

Images



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Project Image Hall Thrusters and Erosion (Lifetime) Measurements
(<https://techport.nasa.gov/image/1769>)

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

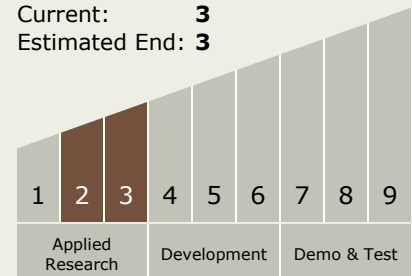
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Co-Investigator:

Brian S Lee

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic